Claims

[c1] An optimum UMTS Modem for multimedia Data, Voice, VoIP in wireless Internet applications comprising of:

an UMTS modem transmitter;

an UMTS modem receiver;

an N-point complex FFT processor and an N-point complex iFFT processor for implementing the multiple sub-channels with Orthogonal Frequency Division Multiplexing method;

a Turbo Codes baseband processor for optimum performance in decoding of noisy receive data, and encoding transmit data;

an 8-PSK Mapper for mapping a 3-bit symbol into a point on the 8-PSK constellations with the I and Q component values;

an 8-PSK De-mapper for converting the received set (I,Q) values from the complex FFT processor into soft-decision values for the Turbo Code baseband processor;

an M-bit serial-to-parallel (S/P) converter for segmenting the input bit-stream into an M number of sub bit-streams;

an M-bit parallel-to-serial (P/S) converter for shifting the decoded data to the output;

a Channel Selector and a Channel De-selector for assigning bit-streams into sub-channels, and also controlling the channel hopping function;

a GI adder and a GI remover for adding and removing guard intervals from the I and Q sequences of samples;

a Symbol wave shaper;

an IQ Modulator for modulating the I and Q sequences of samples and adding them into a transmit signal;

an IQ Demodulator for demodulating the receive signal and producing the I and Q sequences of N samples; and

an AFC Clock Recovery circuitry for clock synchronization.

[c2] The UMTS modem system of claim c1, wherein the Turbo Codes baseband processor uses SISO 8-state Log-MAP decoder for high-speed and optimum

decoding a plurality of sequences of the receive samples.

[c3] The UMTS modem system of claim c1, wherein the 8-PSK De-mapper produces soft-decision values output.

[c4] The UMTS modem system of claim c1, wherein the complex FFT/iFFT processors sub-divide the UMTS broadband channel into multiple sub-channels by using the Orthogonal Frequency Division Multiplexing method.

[c5] The UMTS modem system of claim c1, wherein the M-bit serial-to-parallel (S/P) converter sub-divides the high-speed R-Mbps input to generate the multiple slow-speed S-Mbps M sub bit-streams; where S-Mbps is equal to R-Mbps divide by N.

[c6] The UMTS modem system of claim c1, further provides a method to divide the UMTS broadband into multiple sub-channels and the uses of an Orthogonal Frequency Division Multiplexing method implemented by N-point complex FFT/iFFT processors where multiple adjacent channels transmit their carriers' frequency which are orthogonal to each other.

[c7] The UMTS modem system of claim c1, further provides a method to divide high-speed bit-stream into multiple slow-speed sub bit-streams for transmitting over the sub-channels.

[c8] The UMTS modem system of claim c1, further provides a method to control channels hopping by re-assign bitstream into another sub-channel.

[c9] A method for UMTS modem transmitting a plurality of high-speed digital information generated from a MAC layer into wireless IP networks comprising the steps of:

(1) sub-divide the high-speed R-Mbps input serial data by shifting it into the M-bit serial-to-parallel (S/P) converter to generate the multiple slow-speed S-Mbps M sub bit-streams;

(2) encode each bit of each bit-streams independently with a Turbo Codes encoder, with coding rate 1/3 and constraint length K=4, to generate a 3-bit

symbol (one data bit and two parity bits);

(3) map the 3-bit symbol into an 8-PSK constellations points to select the values of its I and Q components;

at this point, all the sub bit-streams are done the same as the above step (2), (3);

(4) select a point in the N-point complex iFFT and map the I component into its real part and the Q component into its imaginary par accordingly;

(5) perform the invert complex N-point Fast Fourier Transform to produces the two I and Q sequences of N samples corresponding to the real and imaginary of the complex iFFT products;

(6) add the guard interval to the I and Q sequences of N samples;

(7) modify the I and Q sequences of N samples with and FIR filter Symbol wave shaper;

(8) modulate the I sequence with a Sine carrier, and the Q sequence with a Cosine carrier;

(9) sum the two modulated I and Q with an adder to produce the transmit signal.

[c10] A method for UMTS modem receiving a plurality of high-speed digital information received from the wireless IP networks comprising the steps of:

(1) demodulate the receive signal with a local carrier to produce the I and Q sequences of N samples;

(2) remove the guard interval from the I and Q sequences of N samples;

(3) perform the complex N-point Fast Fourier Transform on the I and Q sequences of N samples to convert them into N complex points data;

(4) de-selector each of N complex point data for each set of (I,Q) values correspond to each of the M bit-streams;

(5) de-map each of the M complex point (I,Q) based on an 8-PSK constellations to produce soft-decision values;

(6) decode the soft-decision value with the Turbo Codes Decoder baseband processor, where data is iteratively decoded until a final decided hard-decoded bit is produced for the output correspond to each bit-stream;

at this point, all bit-streams are done with steps (5) and (6);

(7) latch all M decoded bits into the parallel-to-serial converter and shift out to the output.